EXHIBIT 4

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

In Re Flint Water Cases

Case No. 16-cv-10444
Hon Judith E. Levy
United States District Judge

_____/

DECLARATION OF SHAWN MCELMURRY, Ph.D., P.E.

I, Shawn McElmurry, Ph.D., P.E., declare on oath and state as follows:

1. My name is Shawn McElmurry, Ph.D., P.E.

2. I am of sound mind, over the age of 18, legally competent, capable in all respects of making this declaration, and personally acquainted with the facts stated herein. All the facts contained herein are true, correct, and based on my personal knowledge.

3. I am a licensed Professional Engineer by the State of Michigan (#6201057641).

4. I am a Professor in the Department of Civil & Environmental Engineering at Wayne State University, and the Graduate Program Officer in the Department of Civil & Environmental Engineering at Wayne State University. Between 2014 and 2021 I was an Associate Professor in the Department of Civil & Environmental Engineering at Wayne State University, and between 2008 and 2014

I was an Assistant Professor in the Department of Civil & Environmental Engineering at Wayne State University.

5. I received a bachelor's degree in chemistry from Central Michigan University in 1998. In 2002, I received a M.S. in environmental engineering from Michigan State University. In 2008, I received a Ph.D. in environmental engineering from Michigan State University.

6. I have published more than sixty (60) technical papers on environmental engineering with an emphasis on water.

7. The Flint Water Crisis is one of my significant research interests, with a focus on how and why the water was contaminated, and regarding lead and legionella bacteria.

8. My curriculum vitae, a copy of which is attached as Exhibit 1, provides further information concerning my background, training, and experience, including a list of my publications. A list of the materials I reviewed in this case is attached as Exhibit 2.

9. In 2019 and 2020, Marc Edwards, Siddhartha Roy, and Min Tang published articles[1] advancing a "novel hypothesis," that lead "biosolids monitoring

[1] Roy, S., M. Tang, and M. A. Edwards. 2019. *Lead release to potable water during the Flint, Michigan water crisis as revealed by routine biosolids monitoring data*. Water Res 160:475-483 ("Roy et al. 2019:"); Roy, S., and M. A. Edwards. 2020b. *Efficacy of corrosion control and pipe replacement in reducing citywide lead*

data provides an independent and comprehensive means to estimate water lead release pre-, during and post-Flint Water Crisis (FWC).” Roy et al. 2019 at p. 475.

10. In attempting to support this hypothesis, the authors compared lead level testing by Virginia Tech (“VATECH”),[2] with data provided by the MDEQ regarding lead in biosolids data from the Flint Wastewater Treatment Plant (“FWWTP”) that was provided by the MDEQ, and proposed that through the methodology they employed, lead in biosolids could be used as an accurate and reliable surrogate for water lead levels (“WLLs”) derived from testing the water itself.

11. Before addressing the flaws in their methodology – and its lack of scientific reliability – it is worth noting that neither the methodology itself, nor the novel hypothesis, has been generally accepted in the fields of drinking water engineering nor human exposure science. No governmental agency recommends, endorses, or employs it; and no accredited institution (to my knowledge) teaches it as a valid and accepted method of estimating the amount of lead in drinking water or potential exposure to it.

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exposure during the Flint, MI water system recovery. Environmental Science: Water Research & Technology 6 (11):3024-3031 (“Roy & Edwards 2020”).

[2] This data is set forth in Kelsey J. Pieper et al., *Evaluating Water Lead Levels During the Flint Water Crisis*, 52 Env’t. Sci. Tech., 8124-8132 (2018)

12. In addition to the articles, I have reviewed the declaration of David Madigan, Ph.D. (Madigan Decl.) concerning both the underlying biosolids data provided to the authors by the MDEQ as well as the VATECH water sampling data published by Pieper.

13. As revealed by a close review of the papers, and as Dr. Madigan points out, the "strong" correlation claimed to have been found between lead in the biosolids at the FWWTP and the citywide WLLs found through the VATECH testing, resulted from certain methodological choices concerning the data points to be used in their correlation analysis. First, they claim to have applied a purported one-month offset, whereby they compared WLLs of one month to the biosolids data from the following month. Second, they compared estimated lead mass in the FWWTP biosolids to lead concentration in VATECH WLLs. Third, they used the weighted average of 1/3 First Draw, 1/3 Second Draw, and 1/3 Third Draw for the WLL90 data points.

14. Dr. Madigan explains that absent at least two of these methodological choices, the purported "strong[]" correlation between water lead concentrations and the mass of lead in biosolids found by the authors is nullified in that not only is it

not strong, but it is not statistically significant and actually a negative correlation exists.[3] Madigan Decl. ¶¶16–32.

15. Setting aside for a moment the validity (or in this case invalidity) of these choices (both individually and collectively), the methodology employed to achieve the correlation claimed cannot be considered scientifically reliable unless/until it is tested and reproduced in a statistically significant manner and other confounding factors (discussed later) are adequately controlled for. Certainly, scientific conclusions about the amount of lead in Flint's drinking water at any given time – and more importantly the exposure of its residents to it – cannot be reliably reached absent this.[4]

[3] Based on the analysis performed by Madigan, it seems from the choices to manipulate the data in the aforementioned ways——comparing the *concentration* of lead in water (mass per volume) to *mass flow* (mass per time) in biosolids rather than comparing concentrations in water to concentrations in biosolids or comparing the mass flow from drinking water to the mass flow in biosolids; equally weighting (1/3 weighted average) sequential samples; and assuming, without verifiable evidence, a one-month lag between WLLs and biosolid data——that the positive correlation they published can only be obtained if the data are manipulated in these unsupported ways.

[4] The old axiom that "even a broken clock tells the right time twice a day," is apt here. The authors found a combination of data points that, when all put together, yielded a positive correlation between lead in biosolids and WLLs. The unresolved question is whether the correlation was true and valid, or "the right time twice a day." Only follow up testing, reproduction and control for confounding variables can support the scientific validity and reliability of their methodology. This has not been done.

16. Put differently, using the Roy & Edwards novel hypothesis and the methodology they used to support it (even setting aside all its flaws and weaknesses) to reach conclusions about exposure to lead in drinking water (either quantitatively or temporally) is deeply problematic and fails the test of scientific reliability.

17. Passing this, there are indeed serious flaws in the methodical choices the authors made in manipulating the data to support their novel hypothesis.

18. The decision to employ a one-month lag (comparing the "August" WLLs to the "September" biosolid data), when the actualities of the WLL testing data show that water samples were being taken into September **and past the time that the biosolid data was calculated** is unreliable, because it does not truly account for the purported lag time.[5]

19. Next, even though the MDEQ provided the lead in biosolid data to Roy & Edwards in terms of its *concentration* (milligrams per kilogram), they decided to convert biosolid concentration to a monthly total *mass (i.e. mass flow)*, and then compare their estimate with WLL *concentrations* collected at a single point in time. To properly compare two measures in metals, one would have to complete a mass balance, pairing the mass of metal in drinking water entering the wastewater system

[5] It is disappointing that the article leaves the reader with the impression that a one month offset was actually employed, when the underlying data shows that it was not. Likewise, it is disappointing that the reader was not alerted to the lack of correlation (known to the authors) when the purported one month offset was not employed. Madigan Decl. ¶¶ 18-20.

to the mass of the metal being removed in biosolids. This requires that the mass flow be calculated for drinking water as well as the biosolids, and the timing of these flows must be aligned. This was not done in the article authored by Roy & Edwards.

20. Third, the decision to use the weighted average of 1/3 First Draw, 1/3 Second Draw, and 1/3 Third Draw for the WLL90 data points is unsupported. This is particularly problematic as volumes in each sample differed (1 liter in the first, 500 mL in the second, and 125 mL in the third) with uncaptured water being flushed between samples (Pieper et al. 2018, p. 8125). Based on the volumes sampled, weighting would be 61.5%, 30.8% and 7.7%, for the first, second, and third samples, respectively.

21. The only source Roy & Edwards cited for its justification is Sandvig et al. 2008.[6] While this source discusses issues regarding Lead and Copper Rule compliance, it does not discuss (let alone support) the weighted average methodology used by Edwards and Roy.[7]

[6] Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., West, D., Trussell, R., Trussell, S., Cantor, A., Prescott, A., 2008. Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues. Project 3018. AWWA Research Foundation, Denver. Santos-Echeandía, J., 2009.

[7] As per the discussion above, because the choice of a 1/3 weighted average was unsupported, it cannot be known whether it actually reflects a reality of the relationship between lead coming from faucet water and in sewage biosolids, or if Roy & Edwards simply found "the right time twice a day."

22. Moreover, Roy & Edwards state that "the first draw water is often derived from pure copper pipe, whereas the second draw sample is often from a service line with pure lead or galvanized iron pipe (i.e., the first draw has highest copper and relatively low lead, the *second draw has highest lead* and almost no copper)." Roy et al. 2019 p. 477 (emphasis added).

23. But this claim that "the first draw is often derived from pure copper pipe" ignores the presence of lead solder and lead bearing materials common in residential premise plumbing, something that is common knowledge in the drinking water field. For example, Sandvig et al. 2008, the source cited by Roy et al. 2019 as justification for the spurious weighting, attributes 20-35% of the *mass* of lead in drinking water during sequential sampling from residential taps as coming from premise plumbing (emphasis added). Nowhere in the report by Sandvig et al. 2008 is there a discussion of proper weights to assign to water lead concentrations to assess human exposure or the amount of lead discharged from drinking water systems.

24. Further, Dr. Madigan points out, the data they rely upon from Pieper et al. 2018 at p. 477 (Table 2), shows exactly the opposite trend reported by Roy et al. 2019. For each of the five sampling campaigns, the *First Draw had the highest* lead levels (26.8, 24.5, 15.1, 9.2, and 9.0); the *Second Draw was significantly lower* (11.3, 9.0, 5.7, 3.0, and 3.0), and the Third Draw was even lower (6.6, 3.4, 3.3, 2.8, and

2.2). This observation is consistent with my personal experience in Flint, where I found the first draw sample in many homes had a high level of lead, even following the replacement of lead service lines, suggesting sources other than lead service lines. As such, the data (as set forth by Pieper et al. 2018) is contrary to and therefore fails to support their weighted average WLL choice.

25. Because of the methodological flaws and weaknesses surrounding the critical choices that were necessary to achieve the positive correlation that supported the authors' novel hypothesis, it is highly questionable whether proper scientific testing and efforts at reproduction would validate them. This is yet another reason why the hypothesis and the methodology employed to support it cannot be considered scientifically reliable, and scientifically reliable conclusions cannot be based thereon.

26. In addition, and as mentioned above, proper follow up testing – and moving past the "novel hypothesis" stage – must also control for potential confounding factors. There are at least two factors that are critically unresolved. First, flows entering the FWWTP are dynamic following rainfall events, effectively functioning like a combined sewer system. These dynamic flows likely influence the amount and timing of solids that move through the sewer system. During low flow events some solids likely settle out within the collection system and are essentially held back from the FWWTP, while during high flow events some of the solids

temporarily stored in the collection system are resuspended and delivered to the FWWTP. Additionally, up to 20 million gallons (MG) of sewage is stored in a 10 MG tunnel and a 10 MG Retention Treatment Basin (RTB) to help delay the treatment of large flow events. During exceptionally high flow events, the RTB can exceed capacity and partially treated sewage can be discharged. From January 2009 to January 2016 the City of Flint reports 11 events where partially treated sewage bypassed the FWWTP and was discharged directly to the Flint River.[8] Neither the timing of when these events occurred, nor the accounting of solids settled out in these temporary storage facilities or lost during overflow events have been addressed. Second, the fact that the Flint collection system receives flows from multiple cities outside of Flint, including Burton, Genesee Township, and Mount Morris indicates multiple other contributing factors have not been adequately accounted for in the analysis presented by Roy & Edwards.[9]

27. Any analysis must account for the fact that the FWWTP receives dynamic flows and sewage discharge from multiple cities outside of Flint. The

[8] https://www.cityofflint.com/wp-content/uploads/cofcipdraft_1.20.16.pdf

[9] The importance of other factors is exemplified in the amounts of lead observed in biosolids (mass/month) long before the FWC, in 2011. The amount of lead in biosolids in 2011 exceeds those observed in 2014, yet Roy et al. 2019 can only "speculate that this anomaly may have somehow been linked to treatment upsets or other events during record Detroit rainfall". In other words, the authors propose a relationship that is dwarfed by another factor(s) that they do not control for and historical records show has a greater impact on the amount of lead in biosolids.

authors' failure to do so is concerning because the inclusion of sewage solids from these other cities could have substantially influenced the amount and concentration of lead found in the Flint biosolid samples, especially during periods of heavy rainfall. This factor has not been adequately accounted for.

28. Finally, best practices requires that lead from industrial discharge must be verified from reliable sources and actual data. Here, the authors based their assumption regarding the amount of industrial discharge into the FWWTP on a comment provided via email from a City of Flint employee. Roy et al. 2019 at p. 476. There is no evidence, however, of any effort to verify that information against available sources such as the National Pollutant Discharge Elimination System ("NPDES"), or the Industrial Pretreatment Program ("IPP") reports of the Flint FWWTP.

29. These potential confounding data points (inadequately controlled for by the authors) are of the kind that would be essential to consider when conducting a study of this nature. In other words, they are crucial and essential information necessary to advance the work of the authors past the stage of a novel hypothesis, and which a competent civil and environmental engineer would rely upon and include in reaching any valid conclusions.

30. Overall, the novel hypothesis advanced by the authors, and the methodology employed to support it, are neither generally accepted in the field of

environmental and civil engineering, nor (at least at this point) sufficiently reliable to base any conclusions on. Their critical methodological choices were flawed and unsupported and cannot be said to have proven their novel hypothesis. To base valid and reliable conclusions thereon, violates the basic premise of the scientific method.

I declare under penalty of law that the following is true and correct.

Executed on April 22, 2024
Detroit, Michigan

/s/ SHAWN MCELMURRY
Shawn McElmurry, Ph.D., P.E.

EXHIBIT 1

SHAWN P. MCELMURRY, PhD, PE

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EXPERIENCE

2021-current *Professor,* Department of Civil & Environmental Engineering, Wayne State University

2020-current *Graduate Program Officer*, Department of Civil & Environmental Engineering, Wayne State University
2014-2016

2014-2021 *Associate Professor*, Department of Civil & Environmental Engineering, Wayne State University

2008-2014 *Assistant Professor*, Department of Civil & Environmental Engineering, Wayne State University

EDUCATION

Ph.D. Environmental Engineering, Michigan State University, 2008
Dissertation: *Characterization of Dissolved Organic Carbon: Assessment of Copper Complexation and Export of Carbon from Watersheds as a Function of Land Use*
Co-Advisors: *Thomas C. Voice and David T. Long*
M.S. Environmental Engineering, Michigan State University, 2002
B.S. Chemistry major, Central Michigan University, 1998

PEER REVIEWED PUBLICATIONS (*Limited to recent publication*)

**corresponding author, §graduate student, †undergraduate student*

[61] §Good, S.R.; Harris, A.R.; §Crouch, P.; §Gowan, C.T.; Shuster, W.D.; McElmurry, S.P. (2024) *Lead Bioaccessibility and Commonly Measured Soil Characteristics in Detroit, Michigan.* Applied Geochemistry, 166, 105978. DOI: 10.1016/j.apgeochem.2024.105978

[60] §Schubert, A.; §Harrison, J.; Kent-Buchanan, L.; Bonds, V.; Hughes, S.; McElmurry, S.P.; Seeger, M.; Love, N.G. (2024) *Perceptions of Drinking Water: Understanding the Role of Individualized Water Quality Data in Detroit, Michigan.* PLOS Water, 3(4), e0000188. DOI: 10.1371/journal.pwat.0000188

[59] *Gibson, J.; Desclos, A.; Harrington, J. M.; McElmurry, S.; §Mulhern, R. (2024) *Effect of Community Water Service on Lead in Drinking Water in an Environmental Justice Community.* Environmental Science & Technology. 58(3), 1441-1451. DOI: 10.1021/acs.est.3c01341

[58] *Day, A., O'Shay, S., §Islam, K., Seeger, M., §Sperone, F.G., McElmurry, S.P. (2024) *Boil Water Notices as Health-Risk Communication: Risk Perceptions, Efficacy, and Compliance during Winter Storm Uri.* Scientific Reports. 14, 850. DOI: 10.1038/s41598-023-50286-y

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[56] *§Islam, K.; Laskey, A.; Schwetschenau, S.; §Sheppard, R.; Smith, R.; Sobeck, J.; Stanley, E.; Taylor, K.; Kilgore, P.; Love, N.G.; **McElmurry, S.P.**; Seeger, M. (2023) *Crisis Management of Interdependent Systems, Communication and Coordination: A Perspective on Medium-Scale Events.* Journal of Contingencies and Crisis Management. 14(2): 115-128. http://dx.doi.org/10.1111/1468-5973.12479

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[54] Gupta, S.; Ward, C.; Perera, S.; Gowan, C.; Dittrich, T.; Allen, M.; **McElmurry, S.**; Kodanko, J. (2022) *Development of a highly selective Ni(II) chelator in aqueous solution*. Inorganic Chemistry. Dec 5;61(48):19492-19501. DOI: 10.1021/acs.inorgchem.2c03441. Epub 2022 Nov 22. PubMed PMID: 36414257.

[53] §Schubert, A.; §Pifer, L.; Cheng, J.; **McElmurry, S.P.**; Kerkez, B.; Love, N. (2022) *An Automated Toolchain for Camera-Enabled Sensing of Drinking Water Chlorine Residual.* Environmental Science & Technology Engineering. DOI: 10.1021/acsestengg.2c00073

[52] Chia-Chen, W.; †Connell, M.; § Zarb, A.; § Akemann, C.; †Morgan, S.; **McElmurry, S.**; Love, N.; *Baker, T. (2022) *Point-of-Use carbon-block drinking water filters change gut microbiome of larval zebrafish*. Environmental Microbiology Reports. 14(4), 655-663. DOI: 10.1111/1758-2229.13077

[51] Taylor, K.; §Zarb, S.; §Jeschke, N.; Sobek, J.; Smith, R.; Seeger, M.; McElmurry, S.P. (2022) An Exercise in Disaster: Does Policy Learning Occur after a Tabletop Crisis Scenario? Risk, Hazards & Crisis in Public Policy DOI: 10.1002/rhc3.12256

[50] *Schwetschenau, S.E.; §Schubert, A.L.; Smith, R.J.; Guikema, S.D.; Love, N.G.; **McElmurry, S. P.** (2022) *Improved decision making: a sociotechnical utility-based framework for drinking water investment.* Environmental Science & Technology – Engineering DOI: 10.1021/acsestengg.2c00008

[49] Day,A; §Islam, K; O'Shay, S; Taylor, K; **McElmurry, S.P***;Seeger, M. (2022) Consumer Response to Boil Water Notifications During Winter Storm Uri. Journal of the American Water Works Association (AWWA). DOI: 10.1002/awwa.1919

[48] *§O'Shay-Wallace, S.; Day, A.M.; §Islam, K.; **McElmurry, S.P.**; Seeger, M.W. (2022) *Boil Water Advisories as Risk Communication: Consistency between CDC Guidelines and Local News Media Articles*. Health Communication. 37(2), 152-162 DOI: 10.1080/10410236.2020.1827540

[47] §Alla, L.N.R; §Monshi, M; §Siddiqua, Z, §Shields, J.; §Alame, K.; §Wahls, A; §Akemann, C.; §Meyer, D; §Crofts, E.J.; §Saad, F.; §El-Nachef, J.; §Antoon, M.; §Nakhle, R.; §Hijazi, N.; §Hamid, M.; §Gurdziel, K.; **McElmurry, S.P.**; Kashian, D.R.; Baker, T.R.; *Pitt, D.K. (2021) *Detection of endocrine disrupting chemicals in Danio rerio and Daphnia pulex: Step-one, behavioral screen*. Chemosphere, *271*, p.129442. DOI:10.1016/j.chemosphere.2020.129442

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[45] *Sobeck, J.; Smith-Darden, J.; Hicks, M.; Kernsmith, P.; Kilgore, P.E.; Treemore-Spears, L.; **McElmurry, S.P.** (2020) *Stress, Coping, Resilience and Trust during the Flint Water Crisis. Behavioral Medicine*. 46(3-4) DOI: 10.1080/08964289.2020.1729085 (PMID: 32787730)

[44] *§Day, A.M.; §O'Shay-Wallace, S.; Seeger, M.W.; **McElmurry, S.P.** (2020) *Gender and Presence of Children: Examining Media Uses, Informational Needs, and Source Preferences during the Flint, Michigan Water Crisis.* Journal of International Crisis & Risk Communication Research DOI: 10.30658/jicrcr.3.2.2.

[43] *Zahran, S.; Mushinski, D.; **McElmurry, S.P.**; Keyes, C. (2020) Water Lead Exposure Risk in Flint, Michigan after Switchback in Water Source: Implications for Lead Service Line Replacement Policy. Environmental Research. 181, 108928. DOI: 10.1016/j.envres.2019.108928 (NIHMSID: 1552950; PMID: 31787215)

[42] *§Day, A.M.; §O'Shay-Wallace, S.; Seeger, M.W.; **McElmurry, S.P.** (2019) Informational Sources, Social Media Use, and Race in Flint, Michigan's Water Crisis. Communication studies. DOI: 10.1080/10510974.2019.1567566 (NIHMS ID: 1518397)

[41] Zahran, S., Iverson, T., **McElmurry, S.P.**, Weiler, S., & Levitt, R. (2019). Hidden Costs of Blight and Arson in Detroit: Evidence From a Natural Experiment in Devil's Night. Ecological Economics, 157, 266-277. DOI: 10.1016/j.ecolecon.2018.11.009

[40] Zahran, S.; **McElmurry, S.P.**; Kilgore, P.; Mushinski, D.; §Press, D.; Love, N.; Sadler, R.; *Swanson, M.S. (2018) *Assessment of the Legionnaires' Disease outbreak in Flint, Michigan*. Proceedings of the National Academy of Sciences, February 201718679. DOI: 10.1073/pnas.1718679115

[39] Byrne, B.G.; McColm, S.; **McElmurry, S.P.**; Kilgore, P.E.; Sobeck, J.; Sadler, R.; Love, N.G.; *Swanson, M.S. (2018) *Prevalence of infection-competent serogroup 6 Legionella pneumophila within premise plumbing in Southeast Michigan.* mBio. 9 (1), e00016-18. DOI:10.1128/mBio.00016-18

For a complete list of publications go to: https://scholar.google.com/citations?user=vtHjmu8AAAAJ&hl=en

Datasets

Good, S.R.; Harris, A.R.; Crouch, P.; Gowan, C.T.; Shuster, W.D.; **McElmurry, S.P.** (2023) *"Soil Lead and Commonly Measured Soil Characteristics (Detroit, MI, USA) – PHASE 1".* Open Data at Wayne State. 3. DOI: 10.22237/waynestaterepo/data/1707253381.

Day, A.M.; O'Shay, S.; Islam, K.; Seeger, M.W.; **McElmurry, S.P.** (2023)*"Assessing Boil Water Notices as Health-Risk Communication: Risk Perceptions, Efficacy, and Compliance during Winter Storm Uri".* Open Data at Wayne State. 1. DOI: 10.22237/waynestaterepo/data/1685726763

Patents

Pitts, D.K., **McElmurry, S.P.**, Santure, M. "*Isothermal flow-through system for evaluating toxicity of volatile chemicals*", US. Provisional Application No. 63/605,462, filed December 1, 2023.

RESEARCH PROJECTS *(Limited to recent projects; PI listed first, co-PI unless otherwise noted)*

2022-2027 *Miller, C.; Runge-Morris, M.; et al. Center for Leadership in Environmental Awareness and Research (CLEAR). P42 Superfund Center, National Institutes of Health. Award# P42ES030991. ($11.3M total)*

2022-2023 Smith, R.; Shuster, W.; Seeger, M.; Ernst, J.; McElmurry, S. *CC-CIVIC-PG Track A: Recovering from Expected Flooding Under Residential Buildings (REFURB)*. National Science Foundation Award# 2228584. 10/1/2022-8/31/2023 ($49,999 total)

2022-2023 *McElmurry, S.P. Evaluation of Flow Cytometry for Drinking Water Applications. Great Lakes Water Authority, Contract No. 2200670. ($35,315 total) 4/4/2022-12/31/2023*

2021-2022 *Allen, M.; Dittrich, T.; et al. Rare Earths from US Extractions (REUSE) U.S. Army Corps of Engineers Project #: W912HZ-21-2-0048 ($3.1M total) 9/30/2021 – 09/30/2023*

2018-2022 *McElmurry, S.P.; Seeger, M; O'Donnovan, K.; Sobeck, J.; Smith, R.; Kilgore, P.; Love, N.G.; Kerkez, B.; MacDonald Gibson, J.A. CRISP 2.0 Type 2: Collaborative Research: Water and Health Infrastructure Resilience and Learning (WHIRL). National Science Foundation. Award #1832692 ($1,570,000), 9/1/2018-8/31/2023*

2020-2021 *Harris, A.; Crouch, P.; McElmurry, S.P. Urban Residential Soil Lead Remediation Strategies Project. Erb Family Foundation, subcontract through EcoWorks, Cayuse Award #A17-0555. 1/1/2020-12/31/2021.*

2018-2019 Dittrich, T.; Allen, M.; Boukhalfa, H.; Migdissov, A.; Mohanty,S.; McElmurry, S.P. *AOI 2 Coupled Hydrothermal Extraction and Ligand-Associated Organosilica Media Recovery of REEs from Coal Fly Ash.* U.S. Department of Energy. Award #DE-FE0031565 ($538,849 total)

2017-2019 Harris, A.; Crouch, P.; McElmurry, S.P. Urban Residential Soil Lead Remediation Strategies Project. Erb Family Foundation, subcontract though EcoWorks, Cayuse Award #A17-0555. 6/1/2017-12/31/2019. (subcontract $64,646)

2016-2017 McElmurry, S.P.; Kilgore, P.; Sobeck, J.; Seeger, M.; Zervos, M.; Sullivan, L. (+17 other investigators); *Flint Area Community Health and Environment Partnership (FACHEP) – PHASE II* State of Michigan, Contract #20163753-00. 6/1/2016-12/21/2017 ($3,350,000 total)

2016-2017 McElmurry, S.P. *RAPID: Chemical treatment efficiency of point-of-use filters deployed in Flint, Michigan* National Science Foundation, Award #1633013 ($49,992 total)

2016-2018 McElmurry, S.P.; Miller, C.J.; Pitts, D.K.; Sackey, D.J.; Seeger, M.; Masten, S.J.; Hanna-Attisha, M. *Rapid Response to Contaminants in Flint Drinking Water.* National Institute of Health; National Institute of Environmental Health Sciences. Award # 1R21ES027199-01 ($422,110 total)

AWARDS, CERTIFICATES, HONORS, and LICENSURE

2014, 2015 *Outstanding Reviewer Award*, Journal of Environmental Engineering, American Society of Civil Engineers

2013 *2013 ExCEEd New Faculty Excellence in Teaching Award*, American Society of Civil Engineering

2012 *Outstanding Faculty Service Award*, Engineering Student and Faculty Board, College of Engineering, Wayne State University

2012 *Favorite Professor Award*, Wayne State University

2010, 2011 *Assistant Mentor ASCE ExCEEd Teaching Workshop*–American Society of Civil Engineering (ASCE) – U.S. Military Academy, West Point, NY

2010 *Michigan Professional Engineering License* (#6201057641, date issued 09/24/2010)

2009 *ExCEEd Fellow* –American Society of Civil Engineering (ASCE)

OTHER ACADEMIC OUTPUT AND UNIVERSITY SERVICE (Limited to recent outputs and serves)

- US EPA National Drinking Water Advisory Council (NDWAC) Microbial and Disinfection-by-Product (MDBP) Rule Revisions Working Group Technical Analyst, 2022-2023
- US EPA Workshop titled Michigan Water, Public Health and Healthcare Coordination Workshop, 9/16/2019, Wayne State University, Detroit, MI (Organizer and presenter)
- US EPA Webinar titled A Critical Connection: The Water and Healthcare/Public Health Sectors Webinar - Healthcare/Public Health Sector Focus, 9/26/2019 (Presenter)

- US EPA Webinar titled A Critical Connection: The Water and Healthcare/Public Health Sectors Webinar - Water Sector Focus, 9/19/2019 (Presenter)
- Love, N.G.; Jackson, R.; McElmurry, S.P. (2019) Water stays in the pipes longer in shrinking cities – a challenge for public health. The Conversation. 24 May 2019. https://theconversation.com/water-stays-in-the-pipes-longer-in-shrinking-cities-a-challenge-for-public-health-116119
- Love, N.G., Gebrie, G.S., Adejumo, H.A., McElmurry, S.P. (2019) Drinking Water Infrastructure in Shrinking and Expanding Cities: The Impact on Water Quality and Public Health. In G. Magil and J. Benedict (Eds) Cascading Challenges in the Global Water Crisis. Chapter Three (p. 23-39), Cambridge Scholars Publishing, ISBN: 978-1-5275-2447-7
- Zarb, A.R, McElmurry, S.P., Moldenhauer, J.A. (2017) *Technical to Teachable: The Flint Water Crisis and the Design of Instructions for Assembling Water Sampling Kits*. In *Design, User Experience, and Usability: Theory, Methodology, and Management*, Springer.
- Zahran, S.; Laidlaw, M.A.S.; McElmurry, S.P.; Filippeli, G.M.; Taylor, M. (2015) *Linking Source and Effect: Re-suspended Soil Lead, Air Lead, and Children's Blood Lead Levels in Detroit, Michigan.* In A. Hassan (Ed) *Everyday Environmental Toxins: Children's Exposure Risks* (p. 163-181). Apple Academic Press: Waretown, NJ, ISBN: 978-1-77188-101-2

TEACHING AND ADVISING

Undergraduate Courses

CE4210 – Introduction to Environmental Engineering (2014, 2015)
CE4140 – Environmental Engineering Design (2017-2023)
CE5220 – Environmental Chemistry (2014, 2016)
CE5230 – Water Supply and Wastewater Engineering (2017, 2019, 2021)
CE5995 – Special Topics: Advanced Drinking Water Treatment (2016, 2019)
CE5995 - Special Topics: Drinking Water Distribution System Modeling (2023)

Graduate Courses

CE 6150 – Hydrologic Analysis and Design (2015, 2018, 2020, 2022, 2024)
PSC/CE6910 – Waste Pharmaceuticals: Environmental Impact and Management (2015)
CE7260 – Surface Water Quality Modeling (2015)
CE7580 – Environmental Remediation (2016)
CE7995 – Special Topics: Advanced Drinking Water Treatment (2016, 2019)
CE7995 – Special Topics: Drinking Water Distribution System Modeling (2023)

Committee Chair of 6 Ph.D. and 6 M.S. Thesis Students

Committee Member of 19 Ph.D. and 4 M.S. Thesis Students

OTHER SERVICE

Committee Assignments

- Michigan State University Department of Civil and Environmental Engineering Professional Advisory Board (2016-current)
- College of Engineering P&T Committee (2016-2019, 2021-2024)
- Wayne State University Water Safety Committee (2018-current)
- City of Flint Technical Advisory Committee (TAC), 2015-2021
- City of Flint Water System Advisory Council (WSAC), October 2021 -current

Public Presentations as an Expert in Discipline

- *American Industrial Hygiene Conference and Exposition (AIHce EXP) 2021. Planning for Increases in Legionellosis, AIHCE PDC 805 (3hrs), 27 May 2021*
- *Featured in "Flint's Deadly Water" produced by FRONTLINE, SEASON 2019: EPISODE 16; premiered September 10, 2019 on PBS. Available at https://www.pbs.org/wgbh/frontline/film/flints-deadly-water.*
- *Expert Witness - 67TH DISTRICT COURT FOR THE COUNTY OF GENESEE. THE PEOPLE OF THE STATE OF MICHIGAN v. NICHOLAS LYON (Nov. 15, Dec. 1, 2017)*
- *Expert Witness - 67TH DISTRICT COURT FOR THE COUNTY OF GENESEE. THE PEOPLE OF THE STATE OF MICHIGAN v. EDEN WELLS (Dec. 11, 12, 2017)*
- *Featured technical expert on Secrets of the Earth: Mother Nature Reclaims Buildings, a TV show that premiered on the Weather Channel on October 27, 2014*

Proposal Review Panels

- National Institute of Environmental Health Sciences – SBIR

- National Institute of Environmental Health Sciences – Support for Research Excellence (SuRE) Award (R16)
- National Institute of Environmental Health Sciences – Special Emphasis Panel
- National Institute of Environmental Health Sciences – Research to Action: Assessing and Addressing Community Exposures to Environmental Contaminants
- National Institute of Health - Social Sciences and Population Studies Study Section
- National Science Foundation - Civil, Mechanical and Manufacturing Innovation
- National Science Foundation – Chemical, Bioengineering, Environmental, and Transport Systems
- National Science Foundation - Geography and Spatial Sciences

Editorial Board Memberships

- 2023-Current *Water* (ISSN 2073-4441; Impact Factor = 3.4)
- 2020-2023 *Toxics* (ISSN 2305-63040; Impact Factor = 4.5)

Reviewer (selection of frequent and/or recent journals)

- *Chemosphere*
- *Environmental Advances*
- *Environmental Justice*
- *Environmental Research*
- *Environmental Science & Technology*
- *Environmental Science: Processes & Impacts*
- *Environmental Science: Water Research & Technology*
- *Journal of Environmental Engineering*
- *Journal of Environmental Pollution*
- *Journal of Exposure Science and Environmental Epidemiology*
- *Journal of Health and Place*
- *Photogrammetric Engineering and Remote Sensing*
- *PLOS ONE*
- *Proceedings of the National Academy of Sciences*
- *Risk Analysis*
- *Science of the Total Environment*
- *Toxics*
- *Water Science and Technology: Water Supply*

EXHIBIT 2

I, Shawn McElmurry, Ph.D., P.E., relied on the following materials as discussed in my declaration.

1. Roy et al., "Lead release to potable water during the Flint, Michigan water crisis as revealed by routine biosolids monitoring data", Water Research, Vol. 160, Sept. 1, 2019, 475-483. doi.org/10.1016/j.watres.2019.05.091.

2. Appendix A. Supplementary Data associated with Roy et al. 2019. Word document available at https://www.sciencedirect.com/science/article/pii/S0043135419304865#appsec1.

3. Roy and Edwards, "Efficacy of corrosion control and pipe replacement in reducing citywide lead exposure during the Flint, MI water system recovery", Environ. Sci.: Water Res. Technol., 2020,6, 3024-3031. doi.org/10.1039/D0EW00583E.

4. Supplementary Information associated with Roy and Edwards 2020. PDF available at https://www.rsc.org/suppdata/d0/ew/d0ew00583e/d0ew00583e1.pdf

5. Pieper et al. "Evaluating Water Lead Levels During the Flint Water Crisis." Environ Sci Technol. 2018; 52(15):8124-8132. doi:10.1021/acs.est.8b00791.

6. Bates no. VATECH_00139353.

7. Bates no. VATECH_00093542

8. Bates no. VATECH_00001830

9. Bates no. COF_FED_0828016

10. Bates no. VATECH_00011234

11. Bates no. VATECH_00069856

12. Declaration of David Madigan, Ph.D.